Arpan Kumar Sharma

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EDUCATION

Purdue University, West Lafayette, Indiana, USA *August 2023 - Present*
PhD in Mechanical Engineering
Advisor: Prof. Partha P. Mukherjee
GPA **3.79/4**

Birla Institute of Technology and Science (BITS), Pilani, India *August 2018 - July 2022*
B.E. (Honors) in Mechanical Engineering
GPA **8.82/10**

RESEARCH INTERESTS

Electrochemical Energy Storage and Conversion, Solid-State Batteries, Conversion Cathodes, Thermal Stability, Mesoscale Physics

RESEARCH EXPERIENCE

Energy and Transport Sciences Lab (ETSL) | Graduate Research Assistant
School of Mechanical Engineering, Purdue University *August 2023 - Present*

- Analyzed optimal particle sizes for active materials and solid electrolytes in high capacity solid-state batteries.
- Developed a mathematical framework to predict electrochemical performance in solid-state lithium-sulfur batteries.
- Developing a finite strain computational framework to investigate chemo-mechanical behavior driven by volume expansion in solid-state lithium-sulfur cathodes.
- Studied thermal stability of solid-state lithium-ion batteries under varied external pressures.

INDUSTRY EXPERIENCE

BAJAJ AUTO LTD. | Engine Calibration Engineer
Pune, Maharashtra, India *August 2022 - July 2023*

- Calibrated engine control units (ECUs) to meet legislative standards and driver expectations.
- Worked on On Board Diagnostics and misfiring of vehicle using different sensors like MAP (Manifold Air Pressure) sensor, lambda (oxygen) sensor, engine temperature sensor, etc.
- Automated calibration data of vehicle, like errors during test run and data analysis using Python scripts.

PUBLICATIONS

1. **Arpan K. Sharma**, Bairav S. Vishnugopi, Abhinand Ayyaswamy, Anindya Nath, Deep Chatterjee, Deepti Tewari, Migo S. Ng, Wan S. Tang, Vinay Premnath, Judith A. Jeevarajan & Partha P. Mukherjee. "Co-design of Active Material and Solid Electrolyte Particulate Phases in Solid-State Battery Composite Electrodes", *ACS Applied Materials and Interfaces* (2025)

2. **Arpan K. Sharma**, Bairav S. Vishnugopi, Elif P. Alsaç, Matthew T. McDowell, & Partha P. Mukherjee. "Passivation-Induced Species Dynamics and Microstructural Evolution in Solid-State Lithium-Sulfur Cathodes". *(under review in Advanced Science)*

3. **Arpan K. Sharma**, Alvaro J. Miguel, Bairav S. Vishnugopi, Alex M. Bates, Nathan B. Johnson, John Hewson, Loraine Torres-Castro & Partha P. Mukherjee. "Pressure-Driven Performance-Safety Tradeoff in Solid-State Batteries". *(under review in Advanced Energy Materials)*

4. Md Shahriar Nahian*, **Arpan K. Sharma***, Bairav S. Vishnugopi, JiYoung Seo, Lirong Zhong, Lili Shi & Partha P. Mukherjee. "Role of Electrolyte Concentration in Polysulfide Shuttle and Electrochemical Performance of Lithium-Sulfur Batteries". *(under review in Advanced Energy Materials)* **(*equal contribution)**

5. Elif P. Alsaç, **Arpan K. Sharma**, Sun G. Yoon, Bairav S. Vishnugopi, Congcheng Wang, Talia A. Thomas, Douglas L. Nelson, Udochukwu D. Eze, Won J. Jeong, John M.Harris, Partha P. Mukherjee & Matthew T. McDowell. "Linking Pressure to Electrochemical Evolution in Solid-State Conversion Cathode Composites". *(under review in ACS Applied Materials and Interfaces)*

6. **Arpan K. Sharma**, Bairav S. Vishnugopi, & Partha P. Mukherjee."Interrogating Volume Expansion Driven Chemo-mechanical Evolution in Solid State Lithium-Sulfur Cathodes". *(in preparation)*

CONFERENCE PRESENTATIONS

1. **Arpan K. Sharma**, Bairav S. Vishnugopi, Alvaro J. Miguel, Deepti Tewari, Vinay Premnath, Wan S. Tang, Judith A Jeevarajan, & Partha P Mukherjee. "Pressure-Driven Thermo-Electrochemical Interaction and Safety in Solid-State Batteries". *248th ECS Meeting, Chicago 2025 (Oral Presentation)*

2. Md Shahriar Nahian, **Arpan K. Sharma**, Bairav S. Vishnugopi, & Partha P Mukherjee. "Electrolyte-Mediated Transport and Polysulfide Shuttle in Lithium–Sulfur Batteries". *248th ECS Meeting, Chicago 2025 (Presented by Md Shahriar Nahian)*

3. Bichen Shang, **Arpan K. Sharma**, Bairav S. Vishnugopi, & Partha P Mukherjee. "Deep Learning Based Prediction of Degradation Response in Li-Ion Batteries". *248th ECS Meeting, Chicago 2025 (Presented by Bichen Shang)*

4. Elif P. Alsaç, **Arpan K. Sharma**, Bairav S. Vishnugopi, Sun G. Yoon, Congcheng Wang, Douglas L. Nelson, Partha P. Mukherjee & Matthew T. McDowell. "Microstructural Evolution of Solid-State Conversion Cathode Composites". *248th ECS Meeting, Chicago 2025 (Presented by Elif P. Alsaç)*

COURSEWORK

1. **MA 52700** Advanced Mathematics for Engineers and Physicists I *(Grade: A)*

2. **ME 50000** Advanced Thermodynamics *(Grade: A+)*

3. **MA 52800** Advanced Mathematics for Engineers and Physicists II *(Grade: A)*

4. **ME 50500** Intermediate Heat Transfer *(Grade: A)*

5. **ME 59700** Electrochemical Energy Systems *(Grade: A)*

6. **ME 61400** Computational Fluid Dynamics *(Grade: A-)*

7. **MSE 60000** Materials Engineering Fundamentals *(Grade: A-)*

8. **ME 51000** Gas Dynamics *(Grade: B-)*

9. **ME 60800** Numerical Methods in Heat, Mass and Momentum Transfer *(Grade: A)*

10. **ME 59700** Battery Safety Analytics (Independent Study) *(ongoing)*

11. **STAT 51100** Statistical Methods *(ongoing)*

12. **NUCL 50100** Nuclear Engineering Principles *(ongoing)*